

# 2-channel PRE / REC amplifier with auto-tracking interface

## BA7180AS / BA7180AFS

The BA7180AS and BA7180AFS are PRE / REC amplifiers developed for use in video cassette recorders. They have been designed for use in two-head decks and feature built-in FB damping, two preamplifiers, a chroma output amplifier, an FM output amplifier (with AGC), an envelope detector, a constant-current BTL-drive REC amplifier (with AGC) and built-in channel and REC / PB switches on a single monolithic IC.

### ●Applications

VCRs

### ●Features

- 1) The playback amplifier has a total gain of 57dB (Typ.), and has a low-noise preamplifier. Designed for VHS-band operation with low external parts count. The ICs have 2 circuits for 2-head VCR applications.
- 2) Two playback output systems (through output and AGC output). The AGC output level is 300mV<sub>P-P</sub> (Typ.); suitable for FM brightness signal output.
- 3) Auto-tracking interface for automated tracking adjustment. The detector characteristic is non-linear to improve tracking accuracy during playback of low signal levels.
- 4) The recording amplifier uses constant-current BLT drive that handles load variations (i.e. head impedance) well, and gives stable recording characteristics. A single circuit is provided for 2-head VCR use.
- 5) Built-in recording level AGC means adjustment of FM recording current is not necessary.
- 6) Head switches for 2-channel PRE / REC system provided.
- 7) Operates off a single 5V power supply, with low power dissipation.

### ●Absolute maximum ratings (Ta = 25°C)

Parameter	Symbol	Limits	Unit
Power supply voltage	V <sub>CC</sub>	7.0	V
Power dissipation	BA7180AS	1000*1	mW
	BA7180AFS	937.5*2	
Operating temperature	T <sub>opr</sub>	-20 ~ +65	°C
Storage temperature	T <sub>stg</sub>	-55 ~ +150	°C

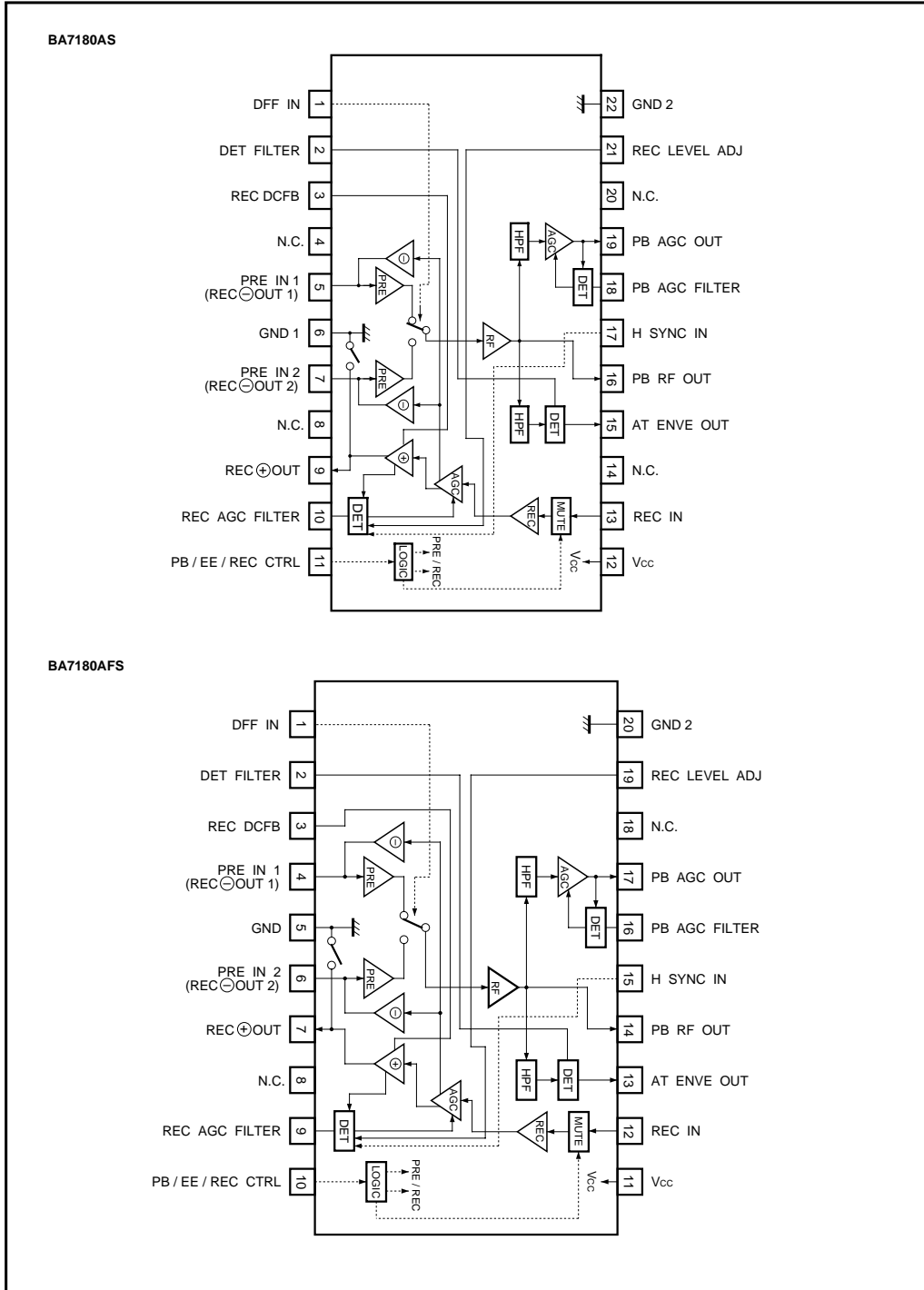
\*1 Reduced by 10.0mW for each increase in Ta of 1°C over 25°C (free air).

\*2 When mounted on a 90mm × 90mm, t = 1.6mm glass epoxy board, reduced by 7.5mW for each increase in Ta of 1°C over 25°C.

### ●Recommended operating conditions (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Playback / recording	V <sub>CC</sub>	4.5	5.0	5.5	V

●Block diagram



●Electrical characteristics (unless otherwise noted, Ta = 25°C, V<sub>CC</sub> = 5.0V and f = 4.0MHz)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions (BA7180AS)	Measurement circuit
〈Playback system〉 (Pin 11 in Fig.1 measurement circuit "H" )							
Quiescent current	I <sub>q (P)</sub>	—	18	45	mA	No signal	Fig.1
Voltage gain CH-1	G <sub>VP1</sub>	54	57	60	dB	Pin 5 input = 0.3mV <sub>P-P</sub> , pin 1: L, pin 16 output measurement	Fig.1
Voltage gain CH-2	G <sub>VP2</sub>	54	57	60	dB	Pin 7 input = 0.3mV <sub>P-P</sub> , pin 1: L, pin 16 output measurement	Fig.1
Voltage gain differential	ΔG <sub>VP</sub>	- 1	0	+ 1	dB	ΔG <sub>VP</sub> = G <sub>VP1</sub> - G <sub>VP2</sub>	Fig.1
Frequency characteristic	ΔG <sub>VF</sub>	- 7	- 3	0	dB	Difference in pin 16 output level for f = 8.0 / 1.0MHz, V <sub>IN</sub> = 0.3mV <sub>P-P</sub>	Fig.1
2nd harmonic distortion	2HDP	—	- 45	- 38	dBc	V <sub>IN</sub> = 0.3mV <sub>P-P</sub> , 8.0MHz spurious	Fig.1
3rd harmonic distortion	3HDP	—	- 45	- 40	dBc	V <sub>IN</sub> = 0.3mV <sub>P-P</sub> , 12.0MHz spurious, guaranteed design value.	Fig.1
Maximum output level	V <sub>OMP</sub>	1.0	1.5	—	V <sub>P-P</sub>	When pin 16 output 2nd harmonic distortion is -30dBc	Fig.1
Crosstalk	CT <sub>P</sub>	—	- 38	- 32	dBc	Difference in pin 16 output level for pin 1: H / L.	Fig.1
Output DC offset	ΔV <sub>ODC</sub>	- 150	0	+ 150	mV <sub>P-P</sub>	Pin 16 output DC offset for pin 1: H / L.	Fig.1
Input conversion noise	V <sub>NIN</sub>	—	0.25	1.0	μV <sub>rms</sub>	RG = 10Ω, input conversion of pin 14 output noise, guaranteed design value.	Fig.1
AGC output level	V <sub>AGC</sub>	250	300	350	mV <sub>P-P</sub>	V <sub>IN</sub> = 0.3mV <sub>P-P</sub> , Pin 19 output measurement	Fig.1
AGC control sensitivity	ΔV <sub>AGC</sub>	—	0.3	2.0	dB	Pin 19 output level difference for V <sub>IN</sub> = 0.15 - 0.6mV <sub>P-P</sub>	Fig.1
AGC amp frequency characteristic	ΔG <sub>VAF</sub>	- 3	0.5	+ 3	dB	Difference in pin 19 output level for f = 8.0 / 1.0MHz V <sub>IN</sub> = 0.3mV <sub>P-P</sub> , guaranteed design value.	Fig.1
PB switch ON resistance	R <sub>ON9</sub>	—	4	10	Ω	Pin 9 impedance, guaranteed design value.	Fig.1
PRE CH 2 threshold voltage	V <sub>TH1H</sub>	3.5	—	V <sub>CC</sub>	V	Pin 1 DC voltage for CH 2 operation	Fig.1
PRE CH 1 threshold voltage	V <sub>TH1L</sub>	0	—	1.2	V	Pin 1 DC voltage for CH 1 operation	Fig.1
ENVE output level	V <sub>ENV2</sub>	1.9	2.4	2.9	V	Pin 15 output measurement when pin 16 output = 100mV <sub>P-P</sub>	Fig.1
ENVE output level	V <sub>ENV3</sub>	3.45	3.7	3.95	V	Pin 15 output measurement when pin 16 output = 400mV <sub>P-P</sub>	Fig.1
ENVE saturation voltage	V <sub>ENV4</sub>	4.0	4.5	—	V	Pin 15 output measurement for large signal	Fig.1
PB mode holding voltage	V <sub>TH10H</sub>	3.8	—	V <sub>CC</sub>	V	Pin 11 DC voltage for PB mode	Fig.1
EE mode holding voltage	V <sub>TH10M</sub>	2.2	—	2.8	V	Pin 11 DC voltage for REC MUTE mode	Fig.1
REC mode threshold voltage	V <sub>TH10L</sub>	0	—	1.2	V	Pin 11 DC voltage for REC mode	Fig.1

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions (BA7180AS)	Measurement circuit
〈Recording system〉 (Pin 11 in Fig. 2 measurement circuit "L")							
Quiescent current	$I_{q(R)}$	—	72	110	mA	No signal	Fig.2
Recording AGC level	$I_{OAR}$	27	30	33	mA <sub>P-P</sub>	Pin 13 input = 125mV <sub>P-P</sub> , pin 9 output measurement	Fig.2
AGC control sensitivity	$\Delta I_{OAR}$	—	0.3	1.5	dB	Pin 9 output level difference for pin 13 input = 62.5mV <sub>P-P</sub> ~ 250mV <sub>P-P</sub>	Fig.2
REC amplifier frequency characteristic	$\Delta I_{OAF}$	-4	-1.5	—	dB	Pin 9 output level difference for f = 8.0 / 1.0MHz, pin 12 input = 125mV <sub>P-P</sub> , guaranteed design value.	Fig.2
2nd harmonic distortion	2HDR	—	-45	-38	dBc	Pin 13 input = 125mV <sub>P-P</sub> 8MHz spurious	Fig.2
3rd harmonic distortion	3HDR	—	-50	-40	dBc	Pin 13 input = 125mV <sub>P-P</sub> 12MHz spurious, guaranteed design value.	Fig.2
Cross modulation distortion	CMDR	—	-50	-40	dBc	4.0MHz ± 630kHz spurious, guaranteed design value.	Fig.2
Maximum output level	$I_{OMR}$	40	50	—	mA <sub>P-P</sub>	When pin 9 output 2nd harmonic distortion is -30dB	Fig.2
Recording current load characteristic	$\Delta I_{ORL}$	-1.5	-0.35	—	dB	Pin 9 output level difference for load L: 8.2 ~ 12μH, guaranteed design value.	Fig.2
Mute attenuation ratio	$MU_R$	—	-45	-38	dBc	Pin 9 output level difference for pin 11: M / H.	Fig.2
AGC mode holding voltage	$V_{TH15H}$	2.7	—	$V_{CC}$	V	Pin 17 DC voltage to maintain recording AGC operation	Fig.2
AGC mode holding voltage	$V_{TH15L}$	0	—	1.2	V	Pin 17 DC voltage to maintain recording AGC stopped	Fig.2

Note:

dBc: dB below carrier (used to express relative level from carrier reference for convenience sake)

●Reference values (unless otherwise noted, Ta = 25°C, V<sub>CC</sub> = 4.8V and f = 4.0MHz)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions (BA7180AS)
ENVE output level	$V_{ENV2}$	1.8	2.3	2.8	V	Pin 15 output measurement when pin 16 output = 100mV <sub>P-P</sub> .
ENVE output level	$V_{ENV3}$	3.35	3.6	3.85	V	Pin 15 output measurement when pin 16 output = 400mV <sub>P-P</sub> .

● Measurement circuits

BA7180AS (playback system)

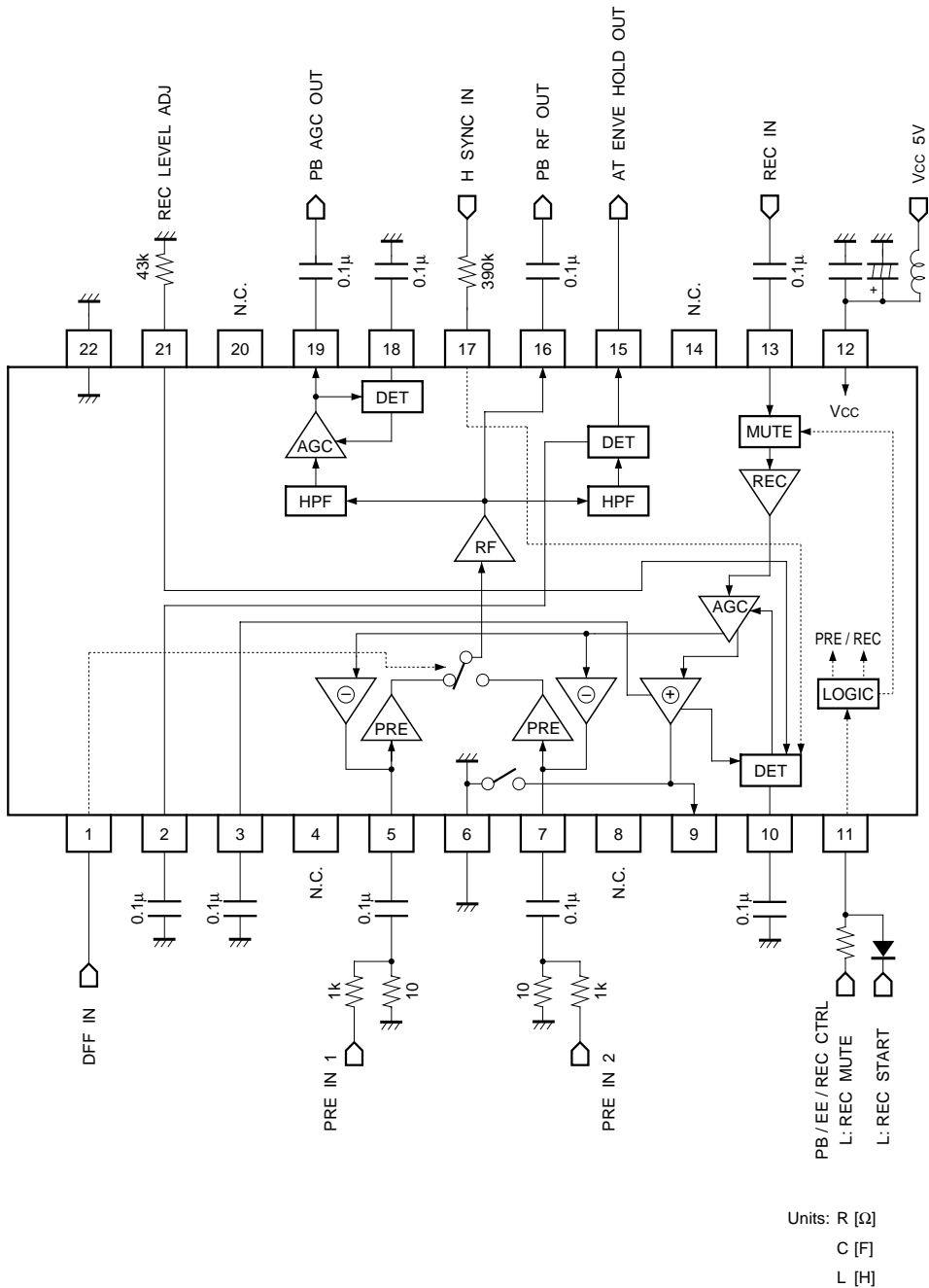


Fig.1

BA7180AS (recording system)

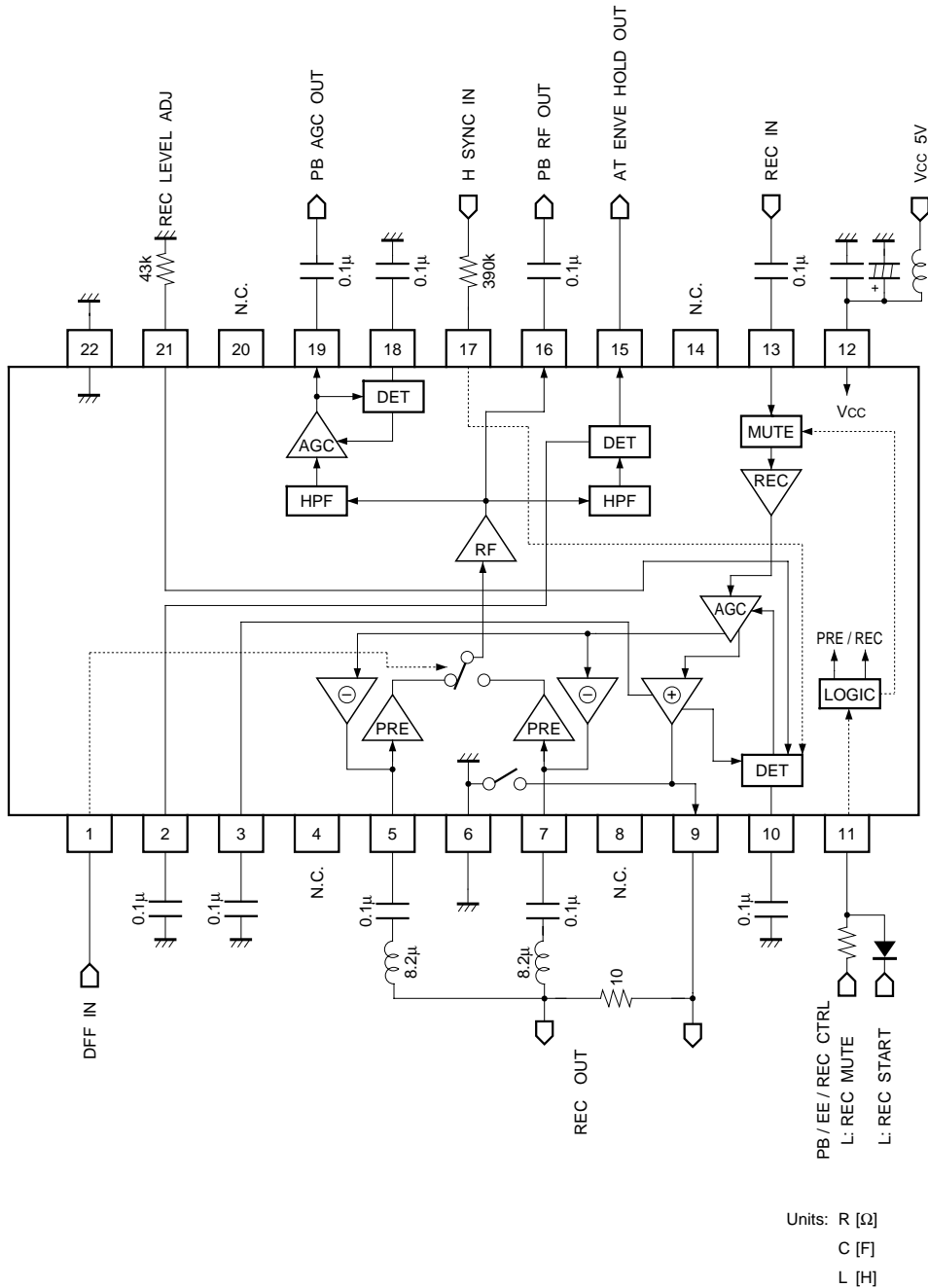
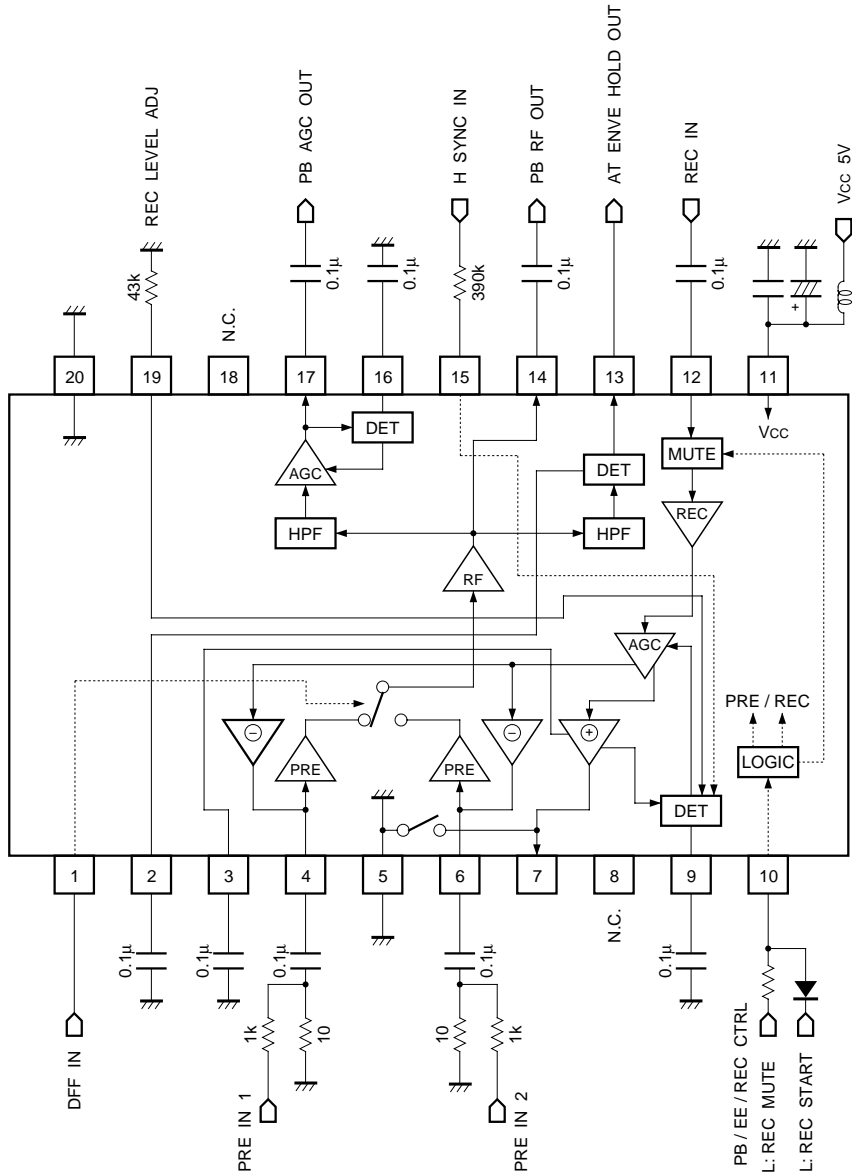


Fig.2

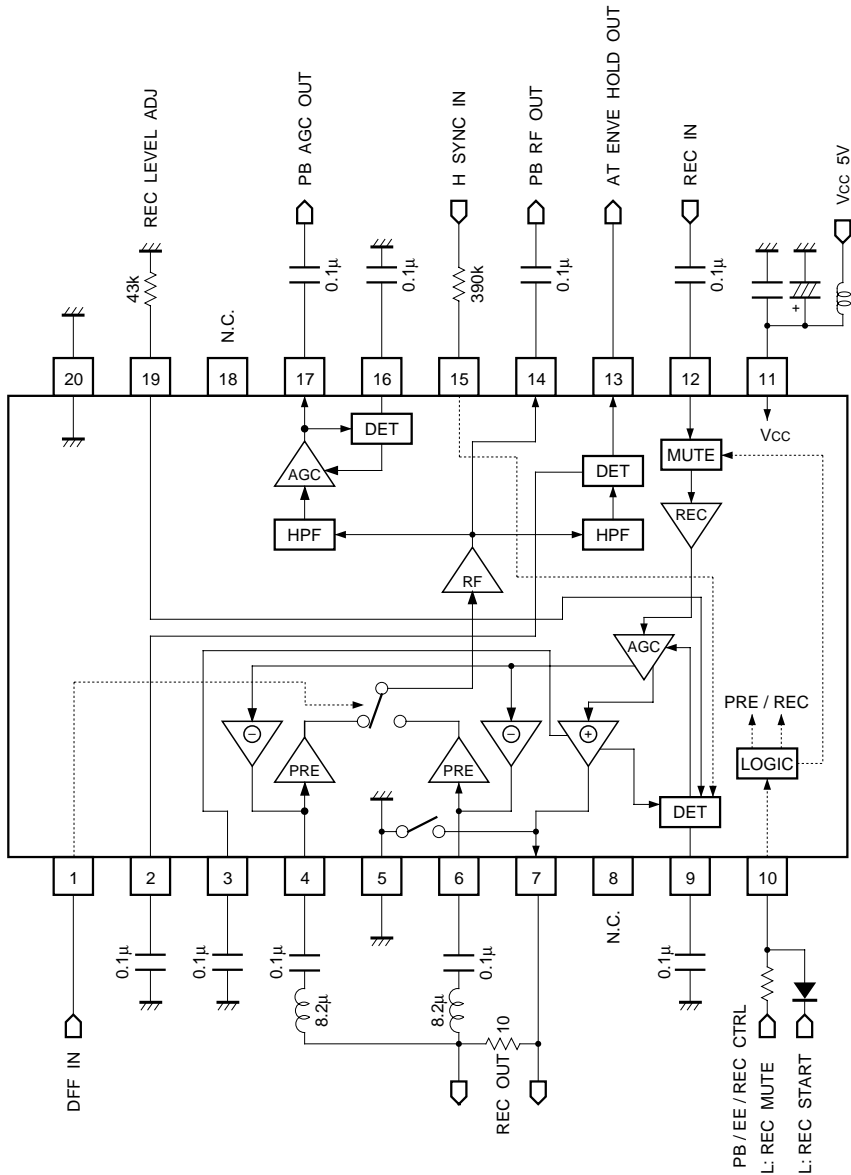
BA7180AFS (playback system)



Units: R [Ω]  
 C [F]  
 L [H]

Fig.3

BA7180AFS (recording system)



Units: R [Ω]  
 C [F]  
 L [H]

Fig.4



## ●Circuit operation

Control system logic table

## (1) DFF IN (pin 1)

- Playback input selection (head switching)

Control pin	Function	Control voltage $V_{CTRL1}$ [V]
DFF IN	Selected playback input	
H	Channel 2 (PRE IN2)	3.5 ~ $V_{CC}$
L	Channel 1 (PRE IN1)	0.0 ~ 1.2

## (2) H SYNC IN (BA7180AS: pin 17, BA7180AFS: pin 15)

- Controls recording AGC detector block operation.

Control pin	Function	Control voltage $V_{CTRL1}$ [V]
H SYNC	AGC detector	
H	ON	2.7 ~ $V_{CC}$
L	OFF	0.0 ~ 1.2

## (3) PB / EE / REC CTRL (BA7180AS: pin 11, BA7180AFS: pin 10)

- Playback / recording mute / recording mode switching

Control pin PB / EE / REC	Mode	Function				Control voltage $V_{CTRL1}$ [V]
		PRE AMP	AT ENVE	REC MUTE	REC AMP	
H	PB	ON	ON	OFF	OFF	3.8 ~ $V_{CC}$
M	REC MUTE	OFF	OFF	ON	ON	2.2 ~ 2.8
L	REC	OFF	OFF	OFF	ON	0.0 ~ 1.2

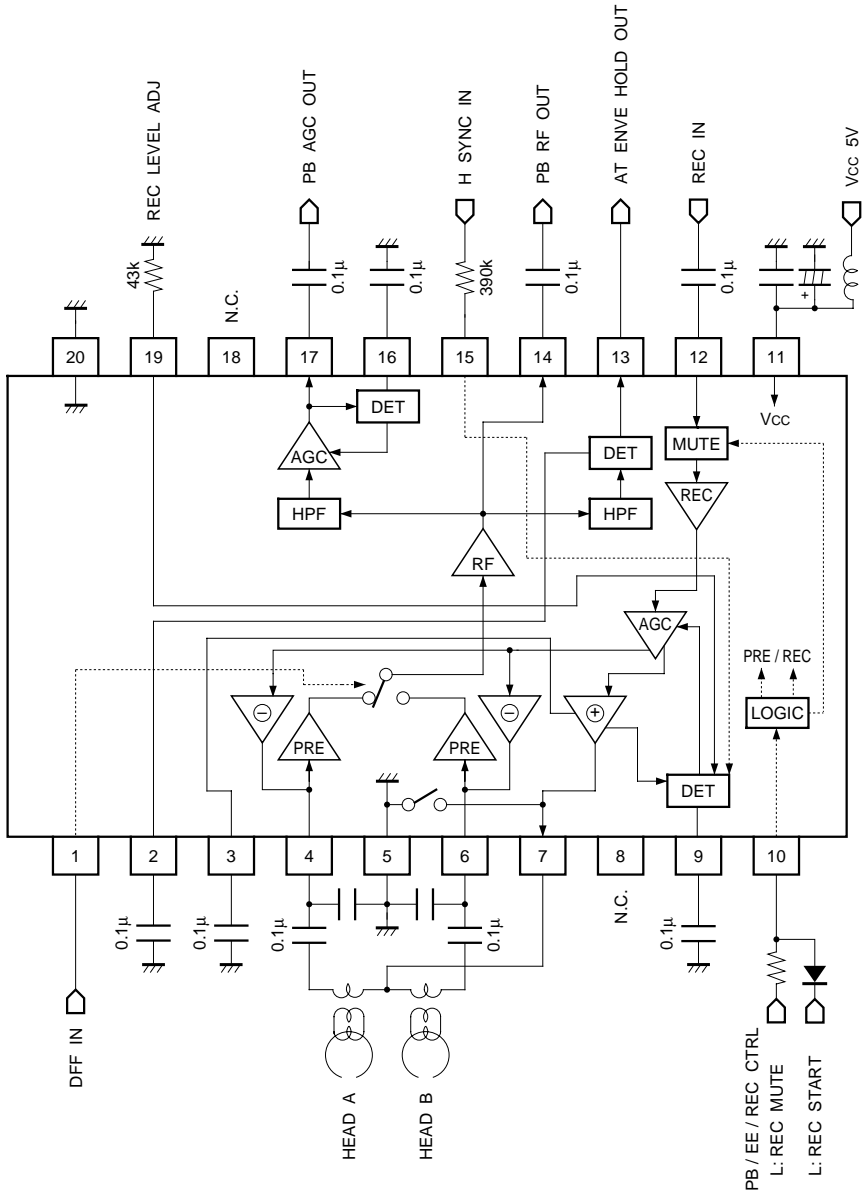
• The PB / EE / REC CTRL pin is pulled up to  $V_{CC}$  via a 33k $\Omega$  resistor.

## ●Operation notes

N.C. pins can be connected to GND.



BA7180AFS



Units: R [Ω]  
 C [F]  
 L [H]

Fig.6

●External dimensions (Units: mm)

